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ABSTRACT

Proceedings of a conference to identify specific projects which might be undertaken to improve the availability and utilization of engineering information in developing countries are summarized. Papers report on engineering information activities of UNESCO and the United Nations Industrial Development Corporation, on engineering information services in highly industrialized countries, information currently available in Arab countries and prospects for improving its accessibility, barriers to transfer of engineering information, and suggestions for improvement. Texts of five task force proposals for projects in housing and construction, engineering standards, energy and power, industrial information systems, and computers and telecommunications are included. Names and addresses of specialized task force members are listed. Appendixes include the program conference, membership of relevant committees, and names and addresses of conference participants. (SK)

ED107248

# REPORT OF THE CONFERENCE ON ENGINEERING INFORMATION IN DEVELOPING COUNTRIES

April 22 - 26, 1974

CAIRO, EGYPT

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## Preface

The Conference on Engineering Information in Developing Countries which was held in conjunction with the fifth annual meeting of the Committee on Engineering Information (CEI) of the World Federation of Engineering Organizations (WFEO), was sponsored jointly by the Egyptian Society of Engineers, the Federation of Arab Engineers, and the CEI. Partial financial support for the Conference was provided by a grant to the Egyptian Society of Engineers from the National Bureau of Standards of the United States of America.

Conference participants, in addition to the members of the CEI, included representatives from Egypt and eight other Arab countries, members of the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Industrial Development Organization (UNIDO), and selected international information authorities. In total, more than 100 engineers and engineering information specialists representing approximately 20 countries contributed to the success of the Conference.

The WFEO Committee on Engineering Information wishes to express its appreciation to Eng. Hamed Kaddah, Eng. Mohamed Sakr, and Dr. Gamal Nassar who, as members of the Organizing Committee, contributed significantly to the success of the Conference.

This report is brief. Its purpose is to communicate the most significant results of a successful conference. To achieve rapid dissemination of this report, we have summarized and edited the written material without review by the original authors. We, therefore, apologize in advance for any inadvertent omissions.

F. Karl Willenbrock, Chairman
WFEO Committee on Engineering Information

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SECTION 1

# OVERVIEW OF THE CONFERENCE ON ENGINEERING INFORMATION IN DEVELOPING COUNTRIES

# OVERVIEW OF THE CONFERENCE ON

# ENGINEERING INFORMATION IN DEVELOPING COUNTRIES

Most technical conferences are directed towards furthering knowledge in a specific field of science or technology. The attendees typically are specialists in the field who describe their research results or operational experiences for the purpose of informing their colleagues and of learning from them. The objectives of such conferences are primarily those of disseminating and diffusing technical information to a larger audience.

This Conference on Engineering Information in Developing Countries had a different objective. It was to identify a number of specific projects which the World Federation of Engineering Organization's Committee on Engineering Information (WFEO/CEI) might undertake to improve the availability and utilization of engineering information in developing countries. The CEI with the Egyptian Society of Engineers and the Federation of Arab Engineers planned a conference which would bring together engineering information specialists from a variety of national and international organizations with engineers from Egypt and the Arab nations.

This diverse group was posed with the problem of identifying specific engineering information projects which would be feasible from the standpoint of existing engineering information services and relevant to the specific needs of the Arab countries. The conferees brought to the conference the differing specialized knowledge needed to identify projects which were feasible from the standpoint of presently available information technology, as well as valuable to the engineers in Arab Countries.

In order to reach this objective, the conference format was shaped to provide the opportunity for direct interchange among conferees. The Conference started with papers on engineering information activities of the United Nations Educational, Scientific and Cultural Organization and the United Nations Industrial Development Organization, and then with a number of papers about engineering information services in highly industrialized countries. Next a number of papers were given describing the engineering information available in the Arab countries and some proposals for increasing its accessibility. The final series of papers were related to barriers to the transfer of engineering information as well as methods used in some partially-industrialized countries to improve their information dissemination.

Most papers presented were of an informative nature and in some cases were tutorial. Other papers presented the speaker's proposals on what steps should be taken to improve engineering information availability in his country. Short summaries of all the papers presented are given in Section 3 of this report. (Complete copies of the papers may be obtained from the authors who are listed with their addresses in Appendix 4 or from the Egyptian Society of Engineers.)

After the presentation of the formal papers, some preliminary proposals for specific projects were discussed. On the third day of the Conference five special task forces were formed to develop particular proposals for presentation to the Conference. On the fifth and final day the Chairman of each of the special task forces made a presentation to the Conference. In every case, the presentations were subjected to searching questions by the conferees. As a result, modifications were made and revised proposals were submitted during the second session of the final day. Section 3 of this report includes the names of the chairmen and members of the specialized task forces and their proposed projects. The proposals have been subjected to editing to clarify the meaning, but they are essentially the same as those submitted.

The members of the CEI were asked to study the proposals further and send written comments to the CEI chairman within a two-week period. These comments have been summarized in Section 3 of this report. While critical in nature, the comments are focused on means to strengthen the proposals. The CEI will assist in the implementation of those proposals which it deems worthy and for which appropriate funding can be located.

F. Karl Willenbrock, Chairman
WFEO Committee on Engineering Information

## SECTION 2

## SUMMARIES OF THE CONFERENCE PRESENTATIONS

The order of the summaries in this section follow the order of presentation during the conference. In most cases the summaries were prepared by the author; however, in other cases, the summaries have been prepared from the full papers by the conference report editors. If the original paper was given in French, the summary has been translated into English. In order to publish this report as soon as possible, the edited or translated summaries were not returned to the authors for review. The conference report editors recognize the possibility of introducing errors by this procedure and made every effort to avoid any modification of the author's meaning. Apologies are made to the authors if there were any inadvertent changes. Copies of the complete papers are available from Eng. Hamed Kaddah at the Egyptian Society of Engineers, 9 Ramsis Street, Cairo, Egypt.

# "UNISIST" AND TECHNICAL INFORMATION NEEDS OF DEVELOPING COUNTRIES

Adam Wysocki (UNESCO)

## Introduction

The information needs of scientists and engineers have been the subject of many studies and publications in the past years. A review of both the studies and trends in the present development of information policies and information systems has shown that a distinction can be made between macro (large) and micro (small) models of information programmes and systems. Both meet the needs of scientists and engineers but in different ways. Usually, the macro model is not operational and does not provide information or data directly to the users. It does provide, however, a conceptual framework within which the operational micro models could be developed.

UNISIST is to be considered a macro model or programme on a world-wide basis. One of its main purposes is to serve the information needs of scientists and technologists with special attention to developing countries.

UNISIST is a continuing, flexible programme based on a joint UNESCO-ICSU study whose aims are to co-ordinate existing trends and to act as a catalyst for the necessary developments in scientific and technical information. The ultimate goal is the establishment of a flexible and loosely-connected world-wide network of information services based on voluntary cooperation. UNISIST is to be concerned initially with the basic sciences, applied sciences, engineering and technology; it will be later extended to other fields of knowledge.

The UNISIST work plan for 1973-1974, developed in accordance with the recommendations of the Intergovernmental Conference held in October 1971 and approved by the 17th Session of the General Conference of UNESCO in 1972, has five main objectives:

1. Improving Tools of Systems Interconnection
2. Improving Information Transfer
3. Developing Specialized Information Manpower
4. Developing Science Information Policy and National Networks
5. Giving Special Assistance to Developing Countries

Two priorities are established for the initial stage of the programme development:

(a) Projects dealing with the improvement of tools of systems interconnection;
(b) Projects related to technical assistance to developing countries, especially in training and education.

UNISIST activities can go in three directions:

1. Conceptual (studies, research and policy matters)

Within this area, the following actions can be mentioned as examples:

Establishment of national focal points and UNISIST National Committees
Formulation of information policy objectives
Broad System of Ordering (BSO)
Harmonizing international assistance programmes

2. Normative (establishment of rules, guidelines and manuals)

In this area, the activities with multiplier effect are grouped, such as:

Reference manual for machine-readable bibliographic descriptions
Manual for systems interconnection
UNISIST Handbook for Scientific and Technical Information
UNISIST Manual for the Education of Users of Scientific and Technical Information
UNISIST guidelines:
(a) for organizing training courses
(b) for establishment of thesauri
(c) for International Serial Data System (ISDS)

3. Operational Activities

(a) Establishment of UNISIST information centers or systems (for example ISDS, INFOTERM etc.)
(b) Training courses - for information teachers, managers and specialists
(c) Pilot and UNDP projects

# THE UNIDO INDUSTRIAL INFORMATION CLEARING-HOUSE

V. Pavlov (UNIDO)

The UNIDO Industrial Inquiry Service (IIS) provides practical assistance to developing countries by answering, without charge, their inquiries on problems in industry. It is well known that much of the technical and industrial knowledge needed by developing countries is already available in the industrialized nations and UNIDO is well placed to tap such information for the benefit of developing countries. The service is available to officials and technical personnel of public and semi-public bodies concerned with industrial development as well as to industrial enterprises of all kinds.

The development of the IIS since its formation in 1966 has been the subject of a recently completed evaluative review*. This study presents a quantative analysis of the inquiries received by the IIS for selected categories of questions; types of users; and subject matter. Analysis has also been made of the user organizations, countries, and regions. The following is a summary of some of the conclusions and recommendations of this study.

To date, UNIDO's IIS has provided services to 138 countries. Most of these countries are developing countries. In 1969 the number of inquiries handled by the IIS was 1,974, in 1973 the number was 3,533. This represents an increase of 15 inquiries per working day and a growth of 375%. The IIS is well-known in developing countries and its activities are appreciated.

The role of the IIS is to tap existing sources of information and to transmit the information to inquirers. Sources of information are concentrated mainly in the industrially advanced countries, but may also be, and to an increasing extent are, found in developing countries themselves. So far, the IIS has had modest staff and funds available to provide its services and to cope with the growing volume of work. An analysis of the inquiries according to subject demonstrates the need for staff expertise in several specialized areas such as metallurgy, mechanical and electrical engineering, chemistry, food technology, textiles, building materials and contruction.

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*The UNIDO Industrial Information Clearing-House, V. Pavlov, UNIDO/ISID 84, 30 April 1974.

Our experience at the IIS has demonstrated that the need for information is not simply the need for information transfer, but also it is essential that information be put into a form which is adapted to the needs of the user.

Synthesis of field observations and collections of case studies on successful projects need to be disseminated through problem-focused articles in UNIDO periodicals or technical and development publications.

Cross-fertilization through correspondence and special meetings for UNIDO network-correspondents should be an integral part of the continuing professional work of the IIS, which can best realize its full potential by keeping to modest institutional size, and seeking new ways to respond to the decentralized opportunities following the main principles of a clearinghouse concept.

# ENGINEERING INFORMATION IN THE EASTERN EUROPEAN SOCIALIST COUNTRIES with special regard to the national scientific and technical information system of a small industrializing country

Peter Lazar (HUNGARY)
Ivan Polzovics (HUNGARY)

The Eastern European socialist countries--Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland, Rumania, USSR, and Yugoslavia--established national information systems in the field of science and technology after World War II. These systems show variations in their detailed setup and indicate various stages between intense centralization or decentralization, each one being based upon a national scientific and technical information centre which is exercising, at least methodological, control of the national information system and which fulfils, in any case, the functions of a national referral centre.

The national scientific and technical information systems are maintained and developed by the governments. Their task is to meet the information demand of the national economies in general and especially that of scientific research institutes and industrial enterprises. Information units and special libraries operating in research institutes and enterprises form part of the national systems of scientific and technical information. The network includes also the national patent offices and the national offices of standardization, which have special functions within the system.

Significant research is carried out by the information systems in the field of information science. The number of periodicals, textbooks and handbooks on information science published in the socialist countries bear witness to the extent of scientific research and the results achieved.

The national information system also provides for regular professional training, the most important feature being its postgraduate character, thus providing not simply documentalists but providing graduates in natural sciences, engineering, and economics with complementary training in the information sciences.

The latest phase of development shows the extension of international co-operation between the national information systems of the European socialist countries under the guidance of the International Information Centre for Science and Technology, established in 1969 in Moscow by the member countries of the Committee for Mutual Economic Assistance.

The scientific and technical information system of Hungary consists of a national information agency, the Hungarian Central Technical Library and Documentation Centre, the information centres of the ministries, and the information units of research institutes, enterprises and other institutions (branch centres and special libraries). The various information services provided by the system include current awareness services in the form of abstracting and indexing journals, selective dissemination of information (SDI), digests, retrospective services, subject bibliographies, literature-searches, information retrieval, data documentation, monographs on selected subjects, etc. Translation services are of importance in Hungary, because only a small part of the world's literature on sciences and technology is available in the national language (Hungarian). Reprographic services also play a big role by supplying hard copies and/or microcopies of documents in large quantities based upon modern reprographic equipment.

The development of factographic information services and data banks, similar to computer-based information handling, are foreseen in the near future, and efforts have already been initiated in these fields.

The Hungarian national information system was established to meet first of all the information demands of the country. However, it also provides foreign countries with information on the achievements of Hungarian science and technology and it is making considerable efforts to contribute to the international exchange of information. A special information service of the Hungarian Central Technical Library and Documentation Centre, called TECHNOINFORM, acts as the foreign trade agency of the national centre and executes orders from abroad by undertaking all sorts of processing of Hungarian and foreign literature in the field of science, technology, economics and other subject fields, providing literature searches, information retrieval, translations from and/or into Hungarian as well as other European languages, etc.

The key to further development of the Hungarian national information system and to the improvement of its services lies undoubtedly in the effective application of modern information technology on the one hand, and the extension of international co-operation on the other.

# ENGINEERING INFORMATION SYSTEMS

D. H. Barlow (UK)

In his address at the opening of the Conference, the Minister of Housing posed four questions to which solutions must be found to ensure that adequate engineering information facilities are available within Egypt and within the Arab countries. These questions are: (1) What is the optimum method for making engineering information available? (2) Should one operate with small or large information centres? (3) What regional cooperation is possible? (4) Which international organizations will cooperate in this task?

To answer these questions, it is necessary to know what engineering information services are available. Therefore, I will review some existing systems and try to show the size of the information problem, how information is transferred, the output that abstracting and indexing services provides, and a look at the future.

Size of the Information Problem: Unlike most of the world's natural resources which are steadily being depleted, the world's information is growing at an accelerating rate. The problem of finding the required information when it is needed, and of ensuring its accuracy, has assumed proportions which were undreamed of a generation ago. For example, in the chemical field, information articles have trebled in 14 years from 101,000 in 1957 to over 330,000 in 1973. In the biological field, the story is the same. INSPEC which provides services in physics and engineering follows the same pattern.

How Information is Transferred: The information needs of scientists and engineers differ. Scientists have been trained to communicate information so that other scientists can build on the results of their predecessors. Engineers, on the other hand, use information as a tool to achieve an end. Although both use direct communications, primary journals, and secondary services (abstracting and indexing), the engineers' requirements differ in that they are heavy users of data books, standards, vendor product data, design manuals, and patents.

Indexing and Abstracting Services: Abstracting and indexing services in engineering information have been available for over 85 years. In addition to the English language services, other services covering all disciplines operate in the French language through CNRS and in the Russian language through VINITI. In the German language a number of services exist based on individual disciplines. In fact, over 1,000 abstracting and indexing services now exist to cope with the annual output of approximately 100,000 scientific and technical journals.

A large secondary service producing approximately 160,000 abstracts a year can provide a range of integrated information services. It can generally encompass (as INSPEC does) an input of some 2,000 journals, conference reports, patents, university theses, and other relevant items. It can also cover a wide range of languages and can produce the following outputs:

a. A range of abstract journals produced monthly or biweekly.
b. A range of indexes produced every half year, which provide cumulations of author and subject entries and indexes on reports, conferences and patents.
c. A current awareness service of titles in journals which cover the complete field or selected portions to give a key abstract service.
d. Magnetic tapes for worldwide distribution to allow local centres to produce services.
e. A selective dissemination service (SDI) that matches incoming information to users' needs.
f. A similar service on standardized profiles which cover a range of preset items.
g. Cumulative indexes of authors and subjects in four year periods.
h. On-line retrospective search which, through key board or teleprinter entry, allows access to a Data base.

These services can all be of assistance to developing countries.

A Look At The Future: In the future, abstracting and indexing services will be providing patent-associated literature. Within INSPEC, information from the world's literature is now classified according to the International Patent Classification (IPC) format when the article contains an innovative idea. Thus, engineers can have immediately available to them tape services of articles classified as containing new ideas.

Abstracting and indexing services will also provide product data. Some African states recently requested a study of the feasibility of a data bank on product information for use in the developing countries. Similarly, the World Federation of Engineering Organizations/Committee on Engineering Information (WFEO/CEI) is looking at the problem of product data rationalization. The outlook is for more co-operative ventures between national organizations and abstracting and indexing services.

# THE CANADIAN APPROACH TO SCIENTIFIC AND TECHNOLOGICAL INFORMATION DISSEMINATION

T. D. Keys (CANADA)

Canada is a country well-endowed with natural resources. Although it has a relatively small population, Canada is next to a neighbor that provides a ready market for raw materials. For Canada to move from an economy based on the export of resources to one based on industrialization requires many simultaneous actions. One is the ability to acquire, validate, synthesize, disseminate and utilize scientific and technical information.

Canada is a small producer of scientific and technical information--about 2 to 3% of the world's total. It must, therefore, develop methods of gaining access to information that is produced largely in other countries. Our approach is to start with the development of a national scientific and technical information dissemination system that will provide a flow within the country and will, through a central focal point, coordinate the exchange of international information.

Canada has identified two categories of customers who need scientific and technical information. The first consists of engineers and scientists who can assess and validate information for quality, timeliness and relevance. For this community, we have a computerized abstract search system with the output matched to the users' interest profile. This delivery system is strictly bibliographic, and includes a range of services such as current awareness of selected abstracts, retrospective abstract searching, photocopy service and preparation of bibliographies. This system has evolved from the traditional library type of operation and operates from the National Science Library at the National Research Council. Bearing in mind earlier comments regarding Canada's contribution to scientific and technical literature, it will not surprise you to learn that all abstract services employed in this system are obtained from other countries (for a fee) in the form of computer tapes. These are then transformed into a common machine language to provide ease of searching.

The second category of customers encompasses the small and medium manufacturing industries. For this community of users, a delivery system was evolved which embodies a large element of person-to-person interaction, first to insure that the correct question is being asked and then to provide an answer based on a synthesis of available knowledge. Because of the nature of Canadian industry, small on the one hand and multinational on the other, this delivery system is particularly effective in assisting indigenous enterprises.

The national information network to be developed in Canada will be based on existing information resources and on users' needs. The essential feature in developing such a network is a pilot study to be undertaken to determine the parameters involved in linking a set of national scientific and technical information resources to a diverse set of customers.

I would like to suggest that each country approach its needs for scientific and technological information on the basis of two fundamental considerations. First, each one knows that more information is produced outside one's own country than is produced within its own boundaries. Second, the internal infrastructure to deal with scientific and technological information within a country depends upon the operating procedures of the country's governmental agencies as well as the prevailing political philosophy of that government. Although the former is common to all, the latter is not, and I would like to strike a note of caution for those who might wish to import systems from another nation. Be sure you understand the reason why one nation has chosen to develop an information system in a particular way. You may save a major disappointment, to say nothing of the needless expense.

# THE STATE SYSTEM OF SCIENTIFIC AND TECHNICAL INFORMATION IN THE USSR

V. Krasnov (USSR)

A system of independent scientific and technical information agencies and units was started in the USSR in the 1930's when the first information centers were established and several abstract services initiated. However, most of the activity in this area took place in the last 20 to 25 years. It was during this time that the All-Union Institute for Scientific and Technical Information (VINITI), the All-Union Scientific and Technical Information Center (VINITsentr), dozens of specialized and regional information institutes, and thousands of information divisions or bureaux in industry and in research and development institutes were set up.

At present, the information service network consists of approximately 200 institutes (centers) and 10,000 divisons (bureaux). In developing individual information centers, users' needs have been taken into account. For example, the VNTITsentr which is responsible for the processing and flow of domestic and foreign published literature in science and technology, produces and disseminates the "Referativnyj Zhurnal" (Abstract Journal). The VNTITsentr also keeps a record of R&D projects and supplies information of their results to any interested party in the USSR and to other countries that are members of the international center.

The state-wide system of information agencies carry out a great amount of information work. For example, VINITI subscribes to more than 22,000 titles of scientific and technical periodicals and serials and receives around 8,000 books in 63 languages published in 115 countries of the world. The data base resulting from the processing of this information supports current awareness services, an abstract journal covering almost the whole of the natural sciences and technology, and other information services to scientists and practitioners.

Normally, every information division or bureau is the user of several state-wide services. The information comes to institutions and enterprises where it is processed and distributed according to the specific needs of the users who receive it as information files or single copies. Conversely, in keeping with the procedures of the state-wide systems, information about scientific and technological achievements in these enterprises and institutions is disseminated from the bureaux to appropriate information institutions.

In general, this is an efficient system. One of the contributing factors to its efficiency is the direct economic gain from the utilization of scientific and technical innovations reported and found in information publications. This benefit, which is recognized in many of the industries, adds up to hundreds of millions of roubles for the entire national economy. However, we are acutely aware of the many dissatisfactions with the present scientific and technical information system voiced by its users. Work towards a gradual elimination of the above-mentioned inadequacies is carried out both by the appropriate information services and centrally through the actions taken by the State Committee on Science and Technology (GKNT) of the USSR.

In this brief summary it is not possible to present detailed descriptions of recent important decisions and activities directed at perfecting the state system of scientific and technical information. In general these activities include information automation and mechanization projects; the establishment of new information bureaux in medium and small sized enterprises; and the establishment of training programs for information users at the institute and technical school level.

The foregoing comments describe broadly the state system of scientific and technical information which is constantly being developed thanks to the efforts of dozens of thousand of specialists.

# ENGINEERING INFORMATION CENTRE

N. A. Taleb (EGYPT)

Since the Stone Age, mankind has experienced three main revolutions. First, the Agricultural Revolution moved man from primitive and animal-like conditions into communities where social, religious and cultural aspects developed. Man used the power of the community to provide his means of living through trade and crop sharing rather than depending on his own physical abilities. Second, the Industrial Revolution with the steam engine, marked the ability of man to use the power of machinery to transform his life. New ways of transportation and long distance communications were introduced.

The third revolution is now forming. Some call it the "Information Revolution," others call it the "Intellegence Revolution." It came about after World War II when technology progressed at a very rapid rate. Out of this progress, data banks and data links began to develop through which scientists, physicians and educators were able to work with superior intelligence levels. This is resulting in a new way of life. Some of its features have already taken shape such as computer-managed hospitals, push-button instant entertainment, computer-aided instruction, and the cashless and checkless societies.

The engineering profession has also undergone radical changes in the past two decades. These changes are certain to continue and to accelerate. No longer can the engineer be skilled in a functional speciality such as design, development or marketing; it is not enough that he understands the traditional functions of planning, organizing and controlling. He needs something more. This need is the system approach, and the heart of the system approach is a computer-based information system.

Today, information available to and required by engineers is expanding enormously. To remain ahead of competition and to keep pace with the technological revolution and its impact on products and services, engineers must keep abreast of selected information and must process and organize that information for operation and decision-making.

The need for an Engineering Information Centre in a developing country depends a great deal on the individual country's stage of development. However, all developing countries have some common needs.

Let us take these needs in order:

1. Computer people use the terminology, "Garbage In/Garbage Out." If we feed the computer garbage, we will receive garbage as its output. A sophisticated system is of little value if we do not have the engineering standards, codes, and specifications which are the core and heart of the information. First priority must, therefore, be given to establishing engineering standards, codes, specifications and definitions.

2. If we have codes, specifications and standards but do not have the laws to enforce them, the effort is wasted. Buildings will collapse and lives will be threatened. Therefore, second priority is to urge governments to pass the required laws and to get engineering organizations to have their members adhere to codes of ethics.

3. Real-time and time-shared computers are useless in any information centre if communications are not efficient. Most developing countries experience trouble in getting telephone calls through. Their networks cannot handle data transmitting. Therefore, third priority is to be sure that data links are constructed and maintained if we are to utilize our information banks properly.

4. Bad management has always been a bottle-neck in introducing new technologies. Therefore, the fourth priority is to start a campaign to educate management on how to adapt to new technologies.

5. Finally, the Information Centre should start with a modular concept. Since the needs of the information centre will be limited in the beginning and the hardware changing rapidly, it is preferable to start small, to establish the broad-lines of the system, and then to expand as necessary.

The gap between developed and developing countries is widening. To bridge the gap, it is important for developing countries to use new technologies as soon as possible. Engineers can import this technology quite easily. Computers, terminals, data links and information packages can be bought. But what is needed most is determination on the part of the developing countries to catch up.

# THE ATTITUDE OF TUNISIAN ENGINEERS TOWARD SCIENTIFIC AND TECHNICAL INFORMATION

M. Milad (TUNISIA)

The National Union of Tunisian Engineers has established a work programme with the following objectives:

1. To acquire information about the services and operations of international organizations concerned with engineering information.

2. To evaluate the scientific and technical information needs of Tunisian engineers and to determine how well these needs are being met.

3. To promote the creation of a national center for engineering information services.

With regard to the second objective above, I will now summarize the results of a survey which was designed to provide a quantitative description of the attitudes of Tunisian engineers toward scientific and technical information.

The survey was conducted on a group of 150 engineers who represented a cross section of engineering specialists from both the public and semi-public sectors.

Analysis of the data derived from the survey showed that Tunisian engineers consult scientific and technical documents regularly; that the normal amount of time spent on a document search is at least two hours; and that about 90% of the documents consulted are written in French or English.

It was also found that 80% of the engineers expressed dissatisfaction with the engineering information services which were available to them. The reasons for dissatisfaction included: lack of adequate collections of needed documents; difficult administrative procedures for acquiring needed documents; loss of time in non-productive search activities; etc.

The results obtained from this survey are not characteristic of developing countries only; they can be found in industrialized countries as well. They show that engineers take care to keep themselves informed, that they know what they need, and that they are dissatisfied with what they have.

In conclusion, I recommend that when information services for engineers are being developed consideration should not be limited to scientific and technical information but should also include economic information and that particular attention be given to the needs of local industries and to the national policies pertaining to information services. I would also recommend that national engineering associations play an active coordinating role when new services are planned and developed.

# REPORT ON THE REQUIREMENTS AND PROSPECTS FOR STANDARDIZATION INFORMATIONAL DOCUMENTATION IN LEBANON

M. Hijazi (LEBANON)

In this report, I will review the current situation in Lebanon regarding standardized informational documentation, a problem becoming increasingly acute particularly in developing countries. I will also outline our prospects in this area.

## 1. Documentation and Information Services In Lebanon

Lebanon does not have, in the strictest sense, a "pilot" center for the documentation and standardization for technical information. It has, however, several governmental and private organizations that have obtained information needed by engineers. These organizations include:

a. The Ministries for Planning, Agriculture, and Industry
b. The National Council for Scientific Research (C.N.R.S.)
c. The five universities in Lebanon
d. The two Orders of Engineers in Lebanon
e. Some foreign cultural centers
f. Various scientific associations particularly the Lebanese Association for the Advancement of the Sciences (L.A.A.S.)
g. Various organizations which have libraries in Beirut and publish summaries of scientific activities (meetings, seminars, research, studies)

A major project was recently undertaken which consists of cataloging all of the scientific personnel in Lebanon and the Lebanese professionals working abroad. This catalog contains the following indices:

a. An analytical index of the discipline, classified alphabetically
b. An alphabetical index of the name of the researcher
c. His degrees (titles, specialties, dates, business, country)
d. The work completed
e. The present work (nature and place of business)

## II. Has Lebanon a Real Need for a Model Center of Documentation

Without a standardized documentation service, the Lebanese engineer is forced to accept the technical reviews prepared by manufacturing countries. These reviews are so varied that the Lebanese engineer experiences great difficulty in using the information. This has a negative effect on the engineer's willingness to learn new techniques. This is unfortunate particularly for the developing countries that must make optimal use of its resources.

Lebanon particularly needs documentation in:

a. Techniques for the agricultural and food industries in which 30 per cent of the Lebanese people work
b. Catalog of applied studies of reinforced concrete, urbanization and traffic roads, hygenic and sanitary installations
c. Standardization of organizational projects, particularly of the method, to assure Lebanon of progress in information science

III. Conclusions and Prospects

Locating a documentation center in Lebanon has the following advantages:

a. An integrated communications network at the international rate (land, air, and sea networks; telephone; telex; cable; telestar; cinema; radio; television) is available
b. A technical group of high calibre and mobility based in Beirut, who know both the English and French systems, can assure the efficient management of the documentation center.
c. A librarian, familiar with both the Dewey and the University Decimal Systems, is available
d. Approximately 70 computers of all sizes are presently in use. We are also preparing some information processing centers such as that in Kfarchima which has outstanding staff (doctors of information science, analysts, programmers, and operators)
e. The Faculty of Sciences at the University of Lebanon, with its modern library and competent staff, can handle a model center of documentation

In conclusion, our goal is to establish in Lebanon a documentation and information center, modelled on a data bank, with the following outlooks:

Automatic Documentation: Computerize the indexing and cataloging activity of the entire library of the prototype center.

Immediate and Modern Reproduction: Utilize all reprographic techniques such as photocopy, microforms, tapes and magnetic discs, perforated cards for the computer

Information Dissemination: Through conference, seminars, and special "mobile libraries"

Thus, with such a center, technical information becomes within the reach of everyone.

# A CENTRAL NETWORK FOR ENGINEERING INFORMATION SYSTEM

S. Shaikhly (IRAQ)

During the past three decades, most Arab countries have embarked on ambiticus industrial development programmes. These programmes have recently acquired added importance since billions of dollars are being invested annually in them. A major concern is that most of these projects are of an engineering nature and are attacked in the traditional manner. They start with an economic and technical feasibility study of the project, proceed to the preliminary report and the design and specification stage of the project, and conclude with the actual construction of the project and, in some cases, with the maintenance of the final product. At each of these stages, the decision maker requires certain information to aid him in making decisions relevant to the projects under consideration and compatible with local requirements and conditions.

The type of information required for most engineering projects can be classified into two categories: documents and data. Documents refer to engineering information publications, data refers to the factual or quantitative aspects in the documents.

Our experience shows that impediments to project development have been the lack of proper and scientific documentation and data services, at both the national and regional levels. We suggest that a central network of documentation and standards be established in one of the Arab Countries to act as a nucleus for an engineering information data bank. Some of the agencies of the Arab League have already established such services, but they are so limited in specialization and scope that they have had very little impact. The network we have in mind must be comprehensive and include all branches of engineering and cover all economic activities.

Before such a centralized system can be established, a number of organizational decisions should be taken. First, member countries should agree on the terms of reference of the centre, adopt a unified definition for all the terminologies, and decide on the standards and codes to be used. Second, each member country should have an organization to develop the feedback process between the centre and the departments concerned. For example, Iraq now has design and construction organizations that undertake all stages of project development for various industries. For example, there is one for design and construction in the oil industry; another in the manufacturing industry; another for building; another for roads and bridges; and another for dams and canals. The absence of national centres in member countries need not hamper the establishment of a regional centre since the information storage and retrieval process can be undertaken by the local units.

We would like to suggest some steps and measures to develop an overall information system.

First, a survey of needs for engineering information should be undertaken (perhaps, by the Federation of Arab Engineers) to establish the areas where there is the greatest demand. Such a survey needs to be very carefully designed to cover a representative section of engineering practice. Second, a unified coding system, with standards and definitions, is a prerequisite for the successful installation and operation of the system. In this connection, existing coding practices can be consulted. Finally, a retrieval system should be developed to cope with both documents and data. The document retrieval system must be capable of handling published engineering information in the most economic way. The system must also have a data retrieval system to deal with numerical information and engineering standards. As the system grows, it might also be necessary to develop some sort of verification technique to separate vital information from that of lesser value.

The system, when finally designed, will be the result of the combined efforts of all parties concerned.

At this stage, we stress the important and vital role computers can play in solving the complex logical process that such a system would present.

# COMMUNICATION AND TRANSFER OF TECHNOLOGY

Y. Mazhar (EGYPT)

This Conference on Engineering Information in Developing Countries is taking place at a decisive moment in Cairo's industrial development history. At no time has there been more need for tackling the problems of improving the transfer of engineering information in developing countries.

During the last three decades technological advances in the highly industrialized countries of the world have progressed at an ever increasing rate. As a result of this continuous acceleration, the problems of the developing countries have increased because they are advancing at a slower rate and the technological gap between "developed" and "developing" countries is widening.

Manufacturing industries in developing countries must obtain new technology in the quickest way possible. Many industries have found it practical to obtain their technology from direct license agreements with internationally accepted manufacturing organizations. At later stages of development, these industries may attempt to establish small units for research and development to develop new technologies and products without the help of more developed partners. However, most industrial organizations in the developing countries of the Arab region have not progressed to a point at which they can support significant research and development efforts. Therefore, in the context of this Conference, it is important to consider the problems associated with the communication of technological information between the licensee in a developing country and a licensor in a developed country.

The terms of an agreement for the supply of technological information for product manufacturing usually provides for the transfer of such information items as design and dimension drawings, test instructions and data, purchasing specifications for materials and standard parts, list of suppliers, assembly instructions, operating instructions, and standards sheets. Experience has shown that there are significant barriers to the transfer of this information which may be grouped into four general categories as follows:

1. Barriers associated with the information screening and approval policies of the licensor.

2. Barriers associated with human error in the gathering, sorting, and tabulating information for transmission to the licensee.

3. Barriers associated with physical losses in transit.

4. Barriers associated with the internal distribution practices of the licensee.

This simple listing illustrates some of the problems associated with transfer and communication of technology from a developed country to a local industrial organization. Each barrier results in the loss of information and slows the technology transfer process. Systematic efforts to reduce or remove these barriers should be undertaken by licensor and licensee managers. Valuable advice and assistance should be sought from international organizations such as UNIDO, UNESCO, and the WFEO/CEI.

# AN AUTOMATED DOCUMENTATION SERVICE: IDCAS EXPERIENCE

M. Madkour (EGYPT)

The Industrial Development Centre for Arab States (IDCAS) is concerned with the field of computerized documentation and the electronic processing of techno-economical data. Also it is concerned with developments in the handling of Arabic data on automated systems and on the transfer of knowledge and information from advanced to developing societies through the gathering and compilation of ready-made data bases.

The IDCAS electronic data processing (E.D.P.) system in its various phases includes:

1. Data receiving and pre-processing.
2. Data capture and maintenance.
3. Data handling and retrieval.
4. Selective Dissemination of Information (SDI) Services.
5. Specific retrospective search strategies.
6. Micro-Documentation services.

Three specific data-bases are included within the system:

1. <u>The data base of Arabic descriptive material</u>

For the first time a complete system was designed and implemented for the creation and handling of an Arabic data base on computers.

Information relevant to the economies and the industrial development of all Arab states was gathered in printed form on a rather exhaustive scale.

- Reports
- Studies
- Periodicals
- Conference proceedings
- Theses

Accepted material was abstracted and fed to the computer to be stored on a magnetic file. An inverted sub-file including a frequency list of the descriptors (keyterms) was also compiled for searching purposes.

Although the actual system is monolingual - Arabic input and output - research for its development and enhancement is underway in order to allow multilingual search and retrieval.

Concurrently another line of research is going on. It seeks to assign genuine hexadecimal codes to the various forms of the characters composing the Arabic alphabet instead of having the hexadecimal codes pertain to the latin characters and then assigning duplicates to the Arabic ones.

2. The data base of Arabic statistical data

This data base is composed of several time series of two-dimensional input-output matrices stored in computers and tabulated from statistical data gathered from Arab countries. These data include foreign trade statistics, national economics figures, production quantities and values, etc.

3. The data base of non-Arabic technological data:

A new project is designed to compile a ready-made data base of technological references gathered from various information sources.

The plan for the proposed system is to design a profile, or a series of profiles, depicting IDCAS fields of interest.

These profiles would be communicated to the chosen automated documentation centres in order to provide on a regular periodic basis, details of the most recent advances in IDCAS fields of interest.

# ENGINEERING INFORMATION IN INDUSTRIALIZING ECONOMIES

## - THE INDIAN TREND IN RETROSPECT AND PROSPECT

H. C. Visvesvaraya (INDIA)

Most people visualize India as a vast subcontinent containing almost one-fifth of the worlds' population, having a variety of climates, food habits, language, dress. Rarely is attention focused on the speed at which the Indian economy is developing. An overall view of the facts will illustrate that India is a typical example of a rapidly industrializing economy.

In such an economy, the needs for engineering information become even more exacting than in the normal course. The engineer has to be given the appropriate information, in the appropriate size, in the appropriate manner, and at the appropriate time. Under these circumstances, technology transfer plays a crucial role.

The Ministry of Industrial Development and Science and Technology in India has the responsibility to provide the technological support and to ensure proper technology transfer. The National Committee on Science and Technology acts as adviser to this Ministry in its scientific and technological activities. There are a large number of R&D institutions working at a national level devoted to various disciplines and subjects. Apart from carrying out R&D, these institutions act as instruments in the transfer of technology. They also generate and disseminate information intended to support industrialization.

The Indian Standards Institution provides standards information service (though not specifically called so) and is directly linked with the International Standards Organization (ISO). The appropriateness and the transfer of technology, which are in consonance with the rapid rate of industrialization, are becoming increasingly important; the new three-dimensional concept which takes into account the orientation of technology, the nature of interface for transfer of technology, and the system within which a standard is required to produce most optimum results is gaining increasing importance.

While there has been a great deal of attention given to information services in India, an industrial information service is not yet on a completely organized national basis. Among the various national institutions, the Indian National Scientific Documentation Center (INSDOC) is totally devoted to information services; it provides various types of information services and promotes and stimulates information activities in the country.

A National Information System for Science and Technology (NISSAT) is being developed linking the existing information facilities and streamlining the entire information activity. The system will consist of national information centres, branch information centres, and local information units. There are about 12 abstracting services functioning. Translation services have also been established in a number of centres but the cost of translations are very high. It has, therefore, been suggested that a world body like UNESCO should establish an international agency which may act as a bank for collecting and getting translations, pooling the world resources of translators, and offering translations in major international languages, at a reasonable fee, to institutions interested in such work all over the world.

# ENGINEERING INFORMATION IN DEVELOPING COUNTRIES

J. O. Osibamowo (NIGERIA)

Before any industry, no matter how small, can be successfully established, there must be a minimal amount of basic information. It is this minimal amount of information that is lacking in many developing countries and even more so in many African countries south of the Sahara, including Nigeria.

In this short address, I will give you an idea of the small amount of engineering information available in Nigeria and its effectiveness. I will then follow-up with suggestions on how the situation could improve, what experiences and expertise we might gain from developed or other developing countries, and what effective assistance we could get from international organizations.

## Sources of Information

Listed below are the various sources of technical information available in Nigeria:

a. Nigeria Institute of Scientific and Industrial Research:

This Institute is based in Lagos, the Federal capital. The instrument establishing the Institute stipulates that it should engage in industrial research and disseminate the results to the public. To date, their research has been directed towards agricultural projects. They are handicapped by lack of adequate manpower and finance. The Government in the last budget, however, has promised to increase their activities.

b. Ministry of Works:

From this source, it is possible to obtain some technical information on soil tests carried out in some areas while executing road and building projects. The information, however, is not readily available.

c. Ministry of Industry

This Ministry is presently managed by administrators who have not as yet acquired a technical staff. Therefore, technical information is not readily available.

d. Universities:

The Universities of Lagos, Ahmadu Bello University, Znian and the University of Nigeria, Nsukka, are the only universities with Faculties of Engineering. They are still in the formative stage and engineering information is limited.

e. Professional Institutions:

At the present time, there are a number of professional institutions in Nigeria. The two noteworthy ones are the Nigerian Society of Engineers and the Nigerian Institute of Architects. These institutions are not strong enough financially to be able to do much technical information dissemination.

From these facts, it can be seen that although the need for engineering information in Nigeria is great, the source is limited. The same situation may prevail in other African countries south of the Sahara.

Suggestions

i. An autonomous, central engineering information centre should be established under the aegis of the Nigerian Society of Engineers.

ii. Local engineering information centres should be established in each of the Nigerian states. They should be attached to the Ministry of Works where the largest number of engineers are located. Data collected by the local centres should be made available to the central information centre in Lagos. Also, information on plants and equipments, modern methods of chemical, electrical or mechanical operations could be passed from international organizations to the central information centre from where effective dissemination will be effected through journals, exhibitions, seminars, lectures and research.

iii. International Aids: Aid from UNESCO, UNIDO or other foreign organizations could go through the Ministry for Foreign Affairs or the Ministry of Industry to the central information centre which will be adequately equipped and financed to discharge the responsibilities in suggestion ii. Aid should also be provided to train staff to manage all centres.

iv. Dissemination of Information: An industrial information field group is an essential element in developing countries. This group should visit factories and works in their areas of operation. There should be a constant flow of information between those who seek information and those who give it. This is public education.

# INFORMATION REQUIREMENTS IN INDUSTRIALIZING ECONOMIES

J. Quevedo-Procel (MEXICO)

The need for engineering information in Mexico is treated within the framework of the Technical Information Service (SIT) of the Mexican Science and Technology Council. The basic activities of SIT are its Liaison Program with industry, its Inquiry Service, and its Technical News Bulletin.

After an initial period of planning and experiment, SIT became operational in August 1972. At present, fifteen people work in SIT, eleven of whom are engineers. Through the Liaison Program, a total of 400 firms have been visited. Through the Inquiry Service, 1,050 inquiries have been received. The Technical News Bulletin has 1,190 subscribers.

Since knowledge is an economic resource, developing countries have to apply knowledge (scientific, technical, economic, social, and managerial) to solve their social and economic problems. The role of SIT is to promote the use of knowledge for production of goods and services in industry. In SIT, we have come to define ourselves as a communication mechanism, whose function is to act as a marketing service for knowledge. SIT also hopes to establish the climate for innovation, to help industry to realize that knowledge is a resource that can be used to solve operational problems, to increase efficiency, and to take advantage of business opportunities.

The role of SIT as a "communication mechanism" has been clearly established. SIT boosts the flow of knowledge towards practical applications through personal contact between SIT's engineers and the potential users of information in the industry. Since the same technique, that of direct contact between salesman and customer, is used for the sale of industrial products, we consider ourselves knowledge salesmen. Our experience shows that engineers need such information as standards, patents, maintenance methods, quality control techniques, properties of materials, new equipment, manufacturing processes, and testing equipment.

There is one other aspect that must be mentioned. In Mexico, there are few companies doing research. The result is that technological factors are not considered in the industrial planning activities. Though industry is affected by technological developments, planning, when done, is based exclusively on economic forecasts. Engineers, who would be expected to introduce technological factors into the planning and operations of a company, have not been taught how to use information as a working tool.

The problem can be solved in two ways: (1) Promote the introduction of information courses into the engineering curricula of educational institutions. (SIT participates in efforts along these lines.) (2) Motivate companies to systematize their use of technical information in planning and operation services so that information tailored to their needs can be provided. Companies can be encouraged to establish information departments and to coordinate all the information activities within the company. In this way, the companies are insured that knowledge is properly used within their company's operations and efficiency increased.

At the time that SIT was organized, activities to lay the foundation for a National Information and Documentation Service were taking place. Setting up this National Service required the use of broad criteria which took into account both the social and the economic development of the country.

The proposed National Information and Documentation Service is defined as a system composed of five subsystems. The first is the infrastructure, which is composed of conventional information services and institutions. The second subsystem is to be the mission-oriented networks. The elements of these networks will be specialized information centers that in the future may become information analysis centers. The core of these networks is a communication mechanism which is the basic operating element of the network. The operations and services of the SIT fall into this category. The third subsystem of the National Information and Documentation Network is made up of horizontal services which provide tools for the first two subsystems. The fourth subsystem is users of information; the fifth is the Council of Science and Technology of Mexico. The functions of the Council are the planning, promotion and coordination of the activities for the National Service; coordination of relations with international organizations; and initiation of activities needed as problems arise.

# BARRIERS TO THE EFFICIENT TRANSFER OF INFORMATION FOR INDUSTRIAL NEEDS

Madame A. David (FRANCE)

## Why do Barriers Exist?

Barriers exist because the information needs of engineers are not restricted to scientific and technical areas. They also include economic, regulatory and societal information. Thus the sources of the information are diverse, making the information-collecting task difficult and time-consuming. Information must first be screened for relevance, and then adapted for use within a specific context.

## What are these Barriers?

Three categories of barriers to the efficient transfer of information have been defined:

(1) Those Related to Document Processing
These barriers are associated with the documentation activities of an information service. Documentation specialists are asked to choose relevant material without assistance from the engineer users.

(2) Those Related to User Acceptance
Many engineer-users are not aware of the information services available to them. Others express dissatisfaction with the information services they receive. Others are reluctant to change their traditional ways of seeking information.

(3) Those Related to Economic and Cultural Constraints
The difficulty of purchasing information services varies according to a country's governmental structure and to the nature of the information. Adequate translation services are expensive and difficult to obtain. Therefore, many engineers will only use information that is available in their native language. However, industry will pay for the information provided the advantages exceed the cost.

## How can these Barriers be Removed?

The activities of information specialists, documentalists, and users must be coordinated. Engineers who are trained in the specialized uses of information should act as middlemen between documentalists and users. They should also influence the actions of libraries and documentation specialists and they need to be convinced of their responsibility in this area.

Also, managers of information systems should function as marketing specialists, and mold the operations of their systems to the needs of information users.

Examples in France

A national French policy was defined and a Bureau of Scientific and Technical Information established within the Ministry of Development. Its council is composed of representatives from industry, public organizations, and other ministries, to the exclusion of documentalists.

As major information systems for agriculture, energy, metallurgy, and other national enterprises are being developed, efforts are being made to establish active interfaces between users and system designers.

Networks are being established which exploit foreign sources of information such as MEDLARS, INSPEC, etc.

Special groups of consultant engineers are being organized to visit industrial and research institutions to help define the institutions' needs for information and to develop ways to satisfy those needs.

Conclusion

Removing barriers to the transfer of information for industrial needs is best accomplished by having the engineer-users cooperate more fully in the design of information services.

## OVERCOMING BARRIERS TO EFFECTIVE ENGINEERING INFORMATION TRANSFER

P. Bjørnstad (NORWAY)

What are we doing for the largest user-group of engineers, who make up over 50% of the total engineering community? This is the group that is subject to the heavy pressure of decision-making and must be kept informed at a minimal expenditure of time. They are employed in all sizes of enterprises, small, medium-sized, and large. Isn't it for this user-group that we should be exerting our efforts? Wouldn't this also mean great contributions to improved transfer of engineering information to developing countries? As far as Norway is concerned: a proposal is going to be made that our national information committee be changed considerably and that more funds be put into areas outside of "classic information and documentation" which, should "only" be given a growth-rate of 5-7% in the next few years.

Proposals for four possible project areas

The following projects might be of help to developing countries in the sector of engineering information.

1. Development of national engineering journals, including:

   a. Training of editorial personnel to get national engineers to contribute their experiences.

   b. Ensure that these experiences focus on factors that are important to the local market and the national industries (encircling the decision-making parameters that are specific for the local market).

   c. Training researchers and editorial personnel to build up summaries of articles that include contributions from suppliers on a local market. Here the job is to bring into focus the essential parameters that should be considered, for example, when evaluating the purchase or replacing or adjusting equipment or materials.

2. Through established national engineering associations and industrial organizations, initiate lecturing activity that aims particularly at:

   a. Promoting national engineers and researchers as lecturers, or engineers and researchers from countries who are working under similar conditions and who therefore more easily can circumscribe the decision-making parameters of the local market (in other words, not mainly experts from developed

countries). Norway, for instance, has drawn very heavily on lecturers from Sweden, a country which has similar conditions as Norway, but is 5-10 years ahead of Norway in industrial and technical development.

b. Making the subjects for these technological and industrial lectures lead to an extensive exchange of views among national suppliers, engineers, engineer-specialists and researchers.

3. The establishment of visiting information services, on the pattern of the Danish Technical Information Center (DTO). In this case, engineers connected with DTO, travel around to industries who have engineers connected with their enterprises. Approximately 500 enterprises are visited each year. On the basis of knowledge gained about the enterprises (their profiles), DTO sends materials, such as reports, books, and articles, to these enterprises without being requested to do so. More than one-third of these companies then ask for more information, if available.

4. Simple dependable models for surveys of user-needs must be developed, so that our actions are not taken on the basis of what we believe and want the most important information needs to be, but on the basis of the use and acceptance of market research as a science and as a valuable tool. This tool can also be utilized in the work of evaluating the worth of our various efforts in the sector of engineering information.

# INCREASED UTILIZATION OF ENGINEERING STANDARDS FOR THE BENEFIT OF DEVELOPING COUNTRIES

L. D. Eicher (USA)

An engineering standard is an engineering practice, established by governmental authority or mutual agreement, to assure dimensional compatability, quality of product, uniformity of evaluation procedures, or uniformity of engineering terminology. Engineering standards are important to the maintenance of quality in manufacturing and to the making of tactical and strategic technical or business decisions. Engineering standard documents are rich sources of technical information and data that are used almost exclusively by engineers.

The recent growth of international trade and other forms of international cooperation has stimulated an increase in international standardization activities. The major international standards bodies are the International Electrotechnical Commission (IEC), and the International Standards Organization (ISO). These bodies have issued approximately 3,000 international standards. More than half of these standards have been issued in the last five years. However, international standards represent less than 2% of the world's total. The other 98% are the products of regional, national, or even local standardization organizations.

Traditionally, these organizations have taken the responsibility for organizing and disseminating information about their own standards. However, the need to consolidate information about existing standards, coupled with the need to coordinate internal standardization activities, has caused the formation and growth of standards information services in many countries. In the United States of America, the National Bureau of Standards (NBS) operates a Standards Information Service (SIS) which provides responses to questions from industry, other U.S. government agencies, and the various standards-writing organizations in the U.S.A.

In France, standards information services are provided by the National Association for Standardization (AFNOR) through its Documentation Center which currently maintains a library containing approximately 180,000 standards and standards-related documents and provides responses to more than 100 inquiries per working day.

In the Federal Republic of Germany, similar services are provided by the German Standards Institute (DNA) through its marketing and public relations divisions, as well as its newly-developed system (DINST) for providing remote access to a machine-readable file containing detailed information about more than 15,000 DNA standards.

Communication between major national centers, such as these, are expected to be enhanced by the formation of the ISO Standards Information Network, which is now in its early stages of development. Initially, the network will consist of the ISO Information Center in Geneva and several existing national centers. Early in 1974, five such centers (France, West Germany, United Kingdom, USSR, USA) will be connected via telex terminals. These national centers will serve as "nodes" of the network and will provide responses to requests from other national centers of the network. The ISO Center in Geneva will serve as the primary source of information concerning internationally-issued standards and will undertake certain organizational tasks concerned with developing the network.

Because of specialized needs for information about engineering standards in developing countries it is recommended that one or more projects be undertaken to establish national or regional centers which would be designed specifically to provide standards information services to the industrializing economies of developing countries. These Standards Information Centers would be provided with direct communication links to one of the ISO network nodes which could also provide orientation and training programs for the Center's personnel. The Centers would initially acquire selected sets of existing standards documents and would develop acquisition programs in response to prevailing demands.

The success of such projects would be expected to depend strongly on effective dissemination of information about the Center's services, an information network by which the Center's information services can be made available to users, and on the Center's ability to structure its services to meet the specific needs of the engineering communities they serve. Sponsoring organizations would have primary responsibility for developing programs to accomplish these objectives.

The possibility of providing services on both a regional and national basis is also worthy of investigation and study.

# CLASSIFICATION AND RETRIEVAL SYSTEM FOR IRON AND STEEL COMPLEX TECHNICAL DOCUMENTS

S. Shalaby (EGYPT)

Documents classification, storage, and retrieval systems are one of the most important fields of engineering information in the developing countries. This is because developing countries import their technical and technological information which is contained in engineering documents that accompany the machines and equipment they import for their industrial development. These engineering documents are frequently the only references for handling, operating, and maintaining the industrial equipment and machinery in the developing countries and any loss in these documents is equivalent to the loss of the equipment itself.

In the Egyptian Iron and Steel Complex, where the engineering documents for construction and machinery erection, operation and maintenance exceeded one million pieces came from more than fifteen design offices and machine builders in the USSR. It was a very difficult problem to classify and retrieve them because of the wide variety of numbering schemes. The system presented in this paper was designed and applied to classify and store these documents on microfilm with the ability of retrieving any one of the million documents within one minute. The system can be considered as a universal classification system for a developing country for documents that carry the technical information about construction and machinery of the iron and steel industry.

The following are the main outlines of the system:

1. The division of the complex into main sub-complexes that forms integrated industrial zones.
2. Each sub-complex divided into projects according to their functions.
3. Each project divided again into sub-projects, each one of them is the smallest industrial unit or shop.
4. The information itself was categorized into:
    a. Activities: such as civil engineering, electrical, mechanical etc...
    b. Each activity divided into systems such as electrical engineering which was divided into electric power supply, electric power equipment, etc...
    c. Each system divided into sub-systems or assemblies.

d. Each assembly divided into its sub-assemblies, sub-sub and so on until we locate the detail part, (the smallest bit of information that can be found in one document).

The number used to retrieve any document is composed of 5 levels that identify the information required and the sixth level specifies the form of presentation of information on the document; that is to say, whether the information comes as a drawing or a table or a text.

# ESTABLISHMENT OF AN ELECTRICAL INFORMATION CENTRE

A. Amin (EGYPT)

I wish to talk about an experiment which has been started in the Ministry of Electricity, where we have established a documentation centre. This documentation centre could become a nucleus and form a solid foundation from which we can develop an Electrical Information Centre in Cairo, to assist research in electricity.

There has long been a need for such a centre. It is true that we have insufficient information to satisfy our needs but we hope to benefit from what we have now and to establish a system which may be developed in the future to contain more information.

In Egypt there are 17 different power station centres for electricity, and there is an electric net spreading from the High Dam in the South to Alexandria in the north, starting from 500 kv to 380/220 volt and we are thinking of establishing an atomic generating centre.

We also have control despatch centres in which there are as many as half a million documents which have been received from all over the world, particularly from the USA, the USSR and Europe.

We have taken the following steps in order to establish this documentation centre:

(i) We collected information from all the electrical establishments in Egypt, in order to identify the number of documents in each centre and their variations and to ascertain their condition and quality and whether translation is needed.

(ii) We established a classification system and assigned a code number to every document. The system is similar to that described by S. Shalaby in relation to the Iron and Steel Complex Documentation Centre, with the exception that the Complex covers an area of 4000 acres only, while the electrical establishments cover the whole area of the country.

This system has two points of significance; the ability to retrieve documents as in the system described by S. Shalaby and the ability to accept new documents concerning new establishments that arise in the future.

(iii) We have drawn up a schedule for the receipt of documents from all establishments, in order to include the information in the production process, which is the same for both the Ministry of Electricity and for the Iron and Steel Complex.

(iv) In the last stage of the production process, the documents will be put on microfilm and indices will be generated and available on computers.

(v) Several lectures have been given to workers in the electricity sector, so that they may become familiar with the classification system and the use of microfilm libraries.

(vi) Some employees have been trained to manage microfilm libraries. Six of these libraries will be established, three in Cairo, one in Alexandria, one in Talkha and one in Aswan. Each will be provided with reader-print equipment.

The project was started in 1972 and we have now nearly finished photocopying documents collected from the power stations. We have also started photocopying documents of the Control Centre. Microfilms and indices are ready and have been successfully tested. From a collection of one hundred thousand documents, the required information can be reproduced on the reader-print screen in less than a minute.

The collection and processing of this information could very well be a solid foundation of an electrical information centre. In Egypt there are nearly all types of industry and our experts need information in all fields. In this way, we will profit from information sent to us, bearing in mind Madame David's suggestion about getting information through the right channels.

I also think that all questions dealing with the design and establishment of documentation centres in a particular country have to be answered by the people of the country, as they know their particular requirements. Questions such as:

> Should we use microfilm and microfiche?
> Shall we use a manual or an automatic system?
> Should we have a central centre for information
> or several separate centres?

must be answered by the local users of information because what may suit one country may not suit another.

I would like to add that the establishment of this documentation centre was designed in the Ministry of Electricity by experts from the various Electricity Organizations, who were assisted by experts from the Microfilming Centre of Al-Ahram, which is very advanced in this field. They succeeded well in their endeavours.

In conclusion, we must waste no time in establishing the documentation centre; we need documents and information from advanced countries; documentation centres established in developing countries must be fully designed and developed by national experts, to be of better use, although this does not eliminate the requirement for the help of advanced countries in the training domain.

# ELECTRIC POWER NEEDS FOR A DEVELOPING COUNTRY

O. K. Mawardi (USA)

The planning for the electric power requirements for a region makes extensive use of a vast reservoir of known technico-economic and ecological data on fuels and on the processing of energy. The formulation of the outline of a planning procedure for evaluating the electric energy needs of one or more of the Arab Countries is proposed as a project which can exploit the extensive information resources that the UNISIST program could make available.

The study of this need was selected because energy plays a decisive role in the economic growth of a nation. However, an abundant and reliable supply of energy alone is not sufficient for industries to prosper. The cost of energy must be reasonable if a given country is to have its proper share in the growth of the world's economy in the next few decades.

The energy pattern in a region is strongly dependent on the supply and demand for energy in the region. The demand side depends on social, political, economic and technical factors, the supply side is fixed by the availability of natural resources, processing and transportation facilities, by the state-of-the-art of technology, by economic factors depending on national and international situations and by the impact of energy on the environment.

One of the objectives of this presentation is to discuss the method of formulation of an energy model for a developing country. This model will be useful in evaluating the probable effects of regulatory action, resources allocation, growth patterns and technology needs to meet social and economic requirements. This model will assist in identifying and quantifying the complex relationship between demand and supply of energy. The energy demands should follow objectives which are in agreement with national goals insofar as the population increase, work force and economic growth are concerned.

The ability of a developing country to supply the needed electric energy in a specified time frame will depend not only on the available technology and the required lead time necessary to complete the construction and tooling up of a power plant but also the availability of capital to underwrite the costs of the power system.

When comparing the various alternatives offered by the technology for power production, one has to consider two kinds of problems: a. Economic evaluation problems which can be solved by technico-economical parameters

aimed at defining actual production cost per kilowatt, and b. Evaluation of factors which affect the operational economy.

It is therefore important to stress the need to understand a considerable number of cost parameters affected by local conditions (on-site adaptive costs, licensing procedures, criteria for optimizing generating stations, etc. ...)

Designers and planners of large scale projects in developing countries such as energy must have strong data sources. Engineering data alone are not enough. Economic, social, and political information is also needed. A systematic effort needs to be made to enlist the help of organizations that have access to other extensive data banks. Typical of such groups are the International Nuclear Information System, of the International Atomic Energy Agency. Through linking these organizations with the UNISIST system and with engineering data sources, a powerful data bank for engineers can be realized.

# SYSTEMS QUESTIONNAIRE

G. Nassar (EGYPT)

## 1. THE BENEFITS OF USING THE QUESTIONNAIRE

This questionnaire was actually used by the task force of a large governmental department which was installing a Management Information System (MIS). The task force's intention was to cut the issuing of reports to a minimum and to provide only essential information. It therefore sent out questionnaires to all those who received reports. The response was amazing. Not only did it prompt a series of to-the-point answers, users were led to decide that many of the reports they currently received were unnecessary. Even before the task force began its task of analyzing the answers, the number of reports being issued was reduced by 30%; thus, the value of such a survey was clearly demonstrated.

Many users had obviously never thought about the reports they received; they just took them for granted. New reports had been occasionally requested but old ones never cancelled if their value proved questionable.

## 2. PROVIDING THE RIGHT INFORMATION

After we study the flow in the organizational structure and the decisions to be made, we are ready to design the system. Our goal consists of two basic steps: (1) to provide every manager with the information that he needs and (2) to provide no manager with more information than he requires.

Often we must balance what the manager wants against what he really needs. Until he begins analyzing his needs, he may ask for information that is not really appropriate for his function - either through habit or because he has not clearly defined what he would do with the information if he received it.

The first step should always be to fill out a questionnaire with questions like those that follow:

1. What is this function?
2. Who performs it?
3. How frequently is it performed?
4. Would you class it as a dynamic function vs. one that can be performed in any convenient time frame?
5. What information is necessary in order to perform this function?

6. Where does it come from?
7. Is this the best source?
8. By what means?
9. How current is it?
10. How accurate?
11. What quantity?
12. What are the other inputs?
13. From whom?
14. By what means?
15. Once the function is completed, what information is disseminated?
16. To whom?
17. By what means?
18. What function is performed by the recipient, if known?
19. Do you have sufficient information - quantity and quality - to perform your function?
20. Is it timely enough?
21. Is it accurate enough?
22. Specifically, what information is needed?
23. Would remote access satisfy your information requirements?
24. Is this capability really necessary considering greater cost?
25. Would exception reports satisfy your information requirements?
26. If not, why not?
27. What information would be required in exception reports?
28. How frequently would exception reports be used?
29. Do you have any recommendations for improving the management information system?

# INFORMATION FOR THE BUILDING COMMUNITY

J.L. Haecker (USA)

Most nations of the world follow the same general process in constructing buildings. This process consists of nine activities:

1. Programming
2. Program Analysis
3. Schematic Design
4. Design Development
5. Construction Documents
6. Bidding
7. Review and Award
8. Construction
9. Occupancy

Each of these activities can be described by the nature of the decisions which must be made during the execution of each activity. When the nature of the decisions are understood, the appropriate information can be provided. Today, the information systems which support these decisions are neither sufficiently developed nor sufficiently responsive to the users' needs. In addition, many of these systems are inefficient and costly. Therefore, discussions regarding the development of information to serve the building construction community must include the following points:

1. Identification of the decision-making process which the information is intended to serve.
2. Identification of the users of the information.
3. Development of an information acquisition system.
4. Development of a classification system suitable for the information acquired.
5. Development of a capability to analyze information.
6. Development of a program to train personnel to operate the information system.
7. Development of rapid, efficient and economic information dissemination mechanisms.
8. Development of a feedback method for updating the information to keep the system responsive to the users needs.

These eight points form a rational approach to the development of information systems to serve the building construction community. They also furnish the background for the following studies which would provide a basis for tackling the information problems associated with the building construction process.

Study 1: Problem Definition

This study would identify the users of building and construction information and how specifically they use the information. (Points 1, 2, and 3 above.)

Study II: Information Handling

This study would identify the source of information, how the information may be acquired and classified, how it may be analyzed to fill the users needs and who would be needed to maintain the information flow. (Points 4, 5, 6, 7, and 8 above.)

To assist the decision makers in the building construction community information services should be developed on national, regional, and international levels so that each nation benefits from the experience of other nations.

# FUNCTIONS OF A CENTRALIZED INFORMATION SUPPORT SERVICE IN AN INDUSTRIAL ORGANIZATION

J. G. Van Oot (USA)

I will describe some of the information services that we supply to the technical personnel of the du Pont Company. I will identify some ways in which our experience could be useful in the discussions that are being held at this meeting.

Our information services are provided primarily by the Central Information Services Division of the Information Systems Department of the du Pont Company. Our concern is with scientific, technical, engineering, and marketing information.

We have a general technical library and a number of other specialized information centers. The latter includes the Central Report Index group which answers questions dealing with proprietary company research and development reports; the group which specializes in searching the patent literature; the Analytical and Test Methods Index group which provides information concerning 15,000 du Pont and 25,000 non-du Pont methods, and the information chemist group who provide reports on new developments and answer questions from a computer-produced index. Specialized indexes are also available for information on chemical hazards, environmental protection, physical properties, and commercial or business activities. Each specialized information center has been developed to meet a need; each is supported by the industrial departments.

The volume of scientific, engineering, and technical information in the world makes it essential that we use information services of other organizations. In some cases materials are purchased directly for in-house use. In other cases, we have contractual arrangements with service bureaux for computer-based services. Many questions that we receive are referred directly to other information centers throughout the world. Over the years, we have identified, tested, evaluated over 1,200 such information centers.

It is not necessary for every departmental information center to undertake an elaborate program of information support. To meet a particular need, information support can be provided in small discrete projects. For example, for the support of plant operations, information support activities could include the creation of an index to project documents or plant equipment. It may be the provision of physical properties data which are needed by design, operations, safety, transportation, storage, and indeed by anyone who has responsibility for handling that material.

Information support may include an index to vendor catalogs, to drawings which are required by the plant, to microfilm projects for storing drawings, and to lists of books and journals needed by the plant.

In the du Pont Company, information specialists in our divisions work with the industrial departments. As new plants are being built or old ones redesigned, information specialists supply information support tailored to the particular needs of the plant. They start at the design stage and work through construction and plant start-up.

Let us draw a parallel between our experiences and the situation under discussion at this conference.

Wherever you have a number of plants being designed, under construction, or in operation, information is needed to carry out these functions properly. Often, the plants cannot afford to maintain extensive information systems nor do they have people trained as information scientists. A centralized information support organization that has the resources and trained personnel can provide the essential missing elements.

A central information organization can train plant personnel in information handling, can teach them where to look when they need information, can provide consultation services in establishing an information program, can provide systems design, operation and maintenance, can maintain contacts with information resources around the world, can advise the plants and laboratories in the area of significant new developments, and can serve as liaison with governmental organizations and trade associations concerned with engineering, science, and technology.

Thus, a central information organization, supported by the government, industry, or a private concern, can provide valuable services so that industries can develop faster than they would without this support.

# SECTION 3

## ENGINEERING INFORMATION PROJECTS RECOMMENDED BY THE SPECIALIZED TASK FORCES

## WITH

## CRITIQUES BY THE COMMITTEE ON ENGINEERING INFORMATION OF THE WORLD FEDERATION ON ENGINEERING ORGANIZATIONS

# ENGINEERING INFORMATION PROJECTS RECOMMENDED BY THE SPECIALIZED TASK FORCES

F. K. Willenbrock

## Introductory Remarks

To evaluate the feasibility and desirability of implementing the projects recommended by the five Specialized Task Forces, we must recognize some of the fundamental characteristics of a successful engineering information system.

Perhaps the most important characteristic in designing and developing such systems is the identification of the user of the information. Precise answers are needed to questions such as who is he, what questions does he want answered, and in what form will the information be most useful. A cost-effective information system cannot be designed and operated unless both the users and the users' questions have been identified.

Another important characteristic of a successful information system is an operative mechanism for delivering the information to the user. An effective delivery system implies adequate communications facilities including mail, telephones, and telegraphs, and computing machines, as well as supporting services such as provided by libraries, computer specialists, and other information processors. The institutions which provide these services are frequently termed the infrastructure. In some countries, a major infrastructure role is played by the professional engineering and scientific societies through their publication of technical periodicals, their meetings, conferences, and workshops on local, national, regional and international levels. Also such societies facilitate the valuable personal interchanges between individuals who share common technical interests and activities. In other countries, governmental agencies perform many of these functions. However, it is essential that there be means of alerting the engineer to the existence of technical information and then making it available in a usable form in a time scale commensurate with his needs.

It should also be recognized that person-to-person communication is a major characteristic of any successful information system. Therefore, information system designers and operators should provide for the human interface between the system and the user.

Since it is not possible to have successful technical information dissemination without identified users and a means of delivering information to that user in a timely and useful form, the design process requires active involvement of the ultimate users of the information whether they be practising engineers, government managers, or university faculty members. Also, no system can be effective unless it can adapt

to change since the information available, the users, and the questions which they ask all change with time. The appropriate information system of a country will of necessity reflect the governmental policies, the state of industrial development, the educational system, and even the social customs of the nation.

Developing countries should seek to make maximum use of existing engineering information systems in the more highly industrialized countries. A number of these systems have developed, through interaction with the users of their services into efficient means of delivering information in a usable form in a timely manner. They can provide a useful input to the internal systems developed by a country. In those cases where local needs require modification of an existing system, the necessary additions will almost invariably be available more rapidly and with lower cost than the construction of a new system.

Developing countries can also benefit from the increasingly effective efforts of the international organizations such as UNESCO and UNIDO to foster and improve the dissemination of scientific and technical information on a world-wide basis. UNESCO supports the UNISIST program which has the objective of increasing compatability among existing information systems, of improving the techniques of transferring technical information, of increasing the availability of trained manpower, and of developing appropriate national information policies and infrastructure.

The proposed engineering information projects which follow include critiques which summarize the comments received from members of the Committee on Engineering Information (CEI). Due to the desire to publish this report promptly, the conference report editors did not have an opportunity to ask the members to review the final version of the critiques.

Report and Recommendations of Specialized Task Force No. 1

Chairman: A. R. Hassanein (EGYPT)

Topic: Housing and Construction

Recommended Project: To study the feasibility of the creation and establishment of hierarchial centers for housing and construction information for developing nations.

Objective: The housing and construction industry contributes substantially to the gross national product of many developing countries. This industry lacks proper information, coordination, trained personnel and equipment for the efficient transfer of technical information. There is no regional center existing now to ameliorate this condition although there are a number of building and building-related research institutes. The objective of this project is to correct this situation and effect the desired transfer of information through the establishment of regional, national and local information units.

Responsible Organizations and Cooperating Organizations: It is suggested that the regional information center be established with the advice, guidance, and counsel of the World Federation of Engineering Organization's Committee on Engineering Information (WFEO/CEI).

It is further recommended that this regional information center support the efforts of national housing and construction information units which are at present in various stages of development.

The support required would include, but not be limited to, the following:

(a) Identification of the process which the information is intended to serve.
(b) Identification of the users of the information.
(c) Determination of the users' need for information.
(d) Development of an acquisitions system.
(e) Development of a suitable classification system and suggested format for information.
(f) Development of a staff capability to analyse information.
(g) Development of a positive program for training suitable personnel to be responsive to the information users' needs.
(h) Development of a rapid, efficient and economic distribution system.
(i) Development of a method for updating the system which will keep it responsive to users' needs.

We further suggest that a prototype regional information center be established and serve as the model for other regional centers as the demand for such centers arise.

Estimated Professional Man-Years Required: The level of effort should approximate 14 Man-Years distributed as follows:

1 Director
4 Professionals, i.e., one architect, two engineers (one civil, one mechanical, one construction materials engineer)
2 Support personnel

NOTE: Facilities or equipment expenses are not included. Participating nations will be expected to assist this joint effort through the contribution of monies, or monies in kind.

## Critique of Proposed Housing and Construction Project

This proposal addresses the important need for improved information systems for housing and building construction. Many of the factors which should be considered if information centers for the housing and construction industry were to be established in developing nations, are identified.

The recommendations suggest that the first step should be the identification of the processes which the information is intended to serve, the identification of users, and determination of users' needs. This would be followed by the development of an acquisition system, classification system and the actual analysis of the information. This seems to be the starting of the project very much from first principles as though no other work had been done in this field.

It is suggested that the feasibility study review other information centres that have been set up in the Housing and Construction industry, such as Sweden, United Kingdom, Canada, France and the Bouwcentrum in The Netherlands, and with this information to see how the techniques and arrangements that have been developed in these countries could be modified to meet the needs of the Arab countries. Spending 14 man years to develop the system seems excessive since many times that amount of effort has already been expended by other countries. A preliminary step would be the study of existing techniques and services, and then the adaption of these to meet local requirements.

Also, the total building construction process is too imprecise for initial study; there should be a focus on an information service for building standards in housing, for materials used in building construction, or for design data related to the needs of the architectural community. By providing a better focus, less costly and more useful systems can be developed.

Report and Recommendations of Specialized Task Force No. 2

Chairman: A.M. Tewfik (EGYPT)

Topic: Engineering Standards

Recommended Project: Development of a Pilot Project for Standards Information Services in Developing Countries

Objective: To develop the capabilities of standards information services in developing countries and assure their efficient utilization by users.

As a pilot project for such services, it is recommended that the capabilities of an existing standards information service in a national standards organization be developed with the following objectives:

1. To ensure the existence of a fairly complete set of international standards and standards of the major industrial countries in a properly organized form to facilitate their use by concerned persons.

2. To link this standards information service through the International Standards Organization (ISO) network to the standards information services of industrial countries to ensure smooth flow of information from the developed countries.

3. To provide translation and abstracting services for standards, starting with selected fields and extending the service gradually to other fields according to the prevailing needs.

4. To enhance utilization of standards information service by users. This is to be achieved by developing the contacts between standards organization and the users, in both planning and development stages, and also to obtain user-feedback when the system is operational.

Suggested Responsible Organizations: The project is proposed to be sponsored by a national standardization organization and, if successful, would serve as a model for other developing countries.

Cooperating Organizations: The development of a national standards information service should proceed with proper coordination with the Arab Standardization and Metrology Organization (ASMO) or similar regional standards organizations. Planning activities for the standards information service should take into consideration the way in which this specialized information service could effectively complement national and regional information programmes.

Technical assistance for the implementation of this Pilot Project could be solicited from United Nations Specialized agencies. Bilateral agreements can be used for the same objective.

Estimated Professional Man-Years Required: The project would require the work of several professional information specialists as well as a number of collaborating engineers during a period of approximately 3 years. They would give consultation and information on standards and provide the necessary link with standardization specialists in the national standards organization and abroad.

## Critique of the Proposed Engineering Standards Project

In view of the importance of engineering standards in any industrialized or industrializing economy, the objectives of this proposal are commendable. The standards organization in each country should take special care to identify the specific needs of the users in that country. Information about these needs is necessary if national standards organizations are to choose the most efficient methods for obtaining and disseminating standards information.

In order to strengthen the tie from the national standards organization to the users in other countries, it is suggested that at least two national standards organizations be involved; one in an Arab country where English is the second language, and the other in a country where French is the second language. Most standards are available in French or English. It is also recommended that the regional standards organization, ASMO, be the third cooperating party in the proposed project. In this way, each national organization can develop independently viable standards information services in support of its own industrial needs, and at the same time, cooperate in standards information activities undertaken on a regional basis.

This project is well-focused on a specific type of engineering information. Detailed means of disseminating the standards information made available through the ISO network to users both within the countries whose national organizations are selected as well as to other Arab countries should be developed. As soon as this is accomplished, early implementation of this project should be undertaken.

Report and Recommendations of Specialized Task Force No. 3

Chairman: O.K. Mawardi (USA)

Topic: Energy and Power

Recommended Project: To establish a documentation center on the energy industry specifically aimed at helping Arab nations plan their power systems.

Objective: To compile an inventory of technico-economic data on energy consumption, energy sources and energy processing and transportation as well as various regulating matters related to energy and appropriate to the region.

The data gathered will be of help to planners and policy makers. Industrial users can extract specific information of interest from the data bank as the need arises.

The collection of data will emphasize generation (thermal, nuclear, solar, hydroelectric, etc.), tranmission (electric, or oil and gas), distribution, consumption, as well as conservation and regulating policies affecting local and intra-national transport of energy (electric, oil or gas).

Side benefits anticipated are the ability to channel all requests for this kind of information to one center, to translate available information to a common terminology or code, and to assist in the formation of standards for the energy industry common to the region.

The use of telex links between the projected center and appropriate government or other centers in different countries to improve the accessibility of this data bank is recommended.

The work will be divided into projects which can be performed in parallel or in sequence.

The first project proposed is:

1. To gather information, from existing data banks and organizations, on energy sources (available and prospective).

2. To collect from available reports, governmental sources, professional societies, academies and/or private organizations information on energy consumption which can help establish an individual energy pattern for electricity, gas, oil, solar energy, etc.

Responsible Organizations: The appropriate regional engineering organization could expedite the formation of the center.

Cooperating Organizations: To secure the collaboration and needs of existing different energy-engineering organizations throughout the region, it is proposed to have established centers such as IAEA, INSPEC, and the French Energy Network on Information act as consultants to this program. This arrangement should provide the manpower and training of personnel for the program.

Estimated Professional Man-Years Required: It is projected that six man-years of work over a period of one year will be needed to complete the proposed project mentioned above.

It is assumed that information storage and retrieval equipment will be made available not only for the regional use but also for access to other project networks.

## Critique of Proposed Energy and Power Project

Currently, energy information is the subject of intense interest on the part of many developing countries. However, the complexity of energy-related problems makes it very difficult to specify the kind of information most urgently needed, or to identify the planners and policy-makers who would be the user groups. For this reason, the suggested establishment of regional centers for energy information presents many practical problems.

Efforts in the energy information field could follow the pattern of the referral services which are provided by the UNIDO Industrial Information Clearing-House. Such services could provide assistance in locating energy-related data and information from existing sources in other countries.

As a first step, it is recommended that energy-engineering organizations and their information resources within the Arab countries be identified and information about them be made available in a systematic manner. It would then be desirable to set up a data bank by collecting and feeding in information from existing sources in other countries. A wealth of information is available from such sources as the French Energy Network, INSPEC, and the International Atomic Energy Administration (IAEA). It is possible that IDCAS could play a role in the information collection.

Another possibility is that several Arab countries seek to develop a tie to the energy information system in a developed country with the objective of setting up a pilot centre. By means of pilot centres, it should be possible to examine alternate possible methods of operation, and identify users.

Report and Recommendations of Specialized Task Force No. 4

Chairman: S. Shaikhly (IRAQ)

Topic: Industrial Information Systems

Recommended Project No. 1: The Preparation of Users' Directory of Information Centers in Arab Countries

Objective: To provide a ready reference for users of all existing information centers and encourage interchange among these centers.

Responsible Organizations: The main organizer of this activity is to be The Industrial Development Center for Arab States (IDCAS), who will divide the responsibilities amongst member countries and later process and publish the returns.

Cooperating Organizations: All such competent organizations in member countries.

Estimated Professional May-Years Required: The project is estimated to take one year. One man-year in each country is thought to be sufficient. IDCAS can make its own estimates for processing and publishing.

* * * *

Recommended Project No. 2: An Engineering Information Center for Arab Countries.

Objective: To determine the feasibility of establishing an engineering information center for Arab countries, and if found feasible, take all the necessary measures for establishing it. A center is a useful link between the local engineering unions and associations and the international information centers and services. In its first stage it would act as a clearinghouse and would undertake the dissemination of translated engineering material.

Responsible Organizations: The Federation of Arab Engineers

Cooperating Organizations: UNIDO, UNESCO, WFEO, INSPEC, etc.

Estimated Professional Man-Years Required: Cannot be specified as yet.

* * * *

Recommended Project No. 3: The Establishment of Local Specialized Industrial Information Centers.

Objective: These centers will be at the level of the branch of industry (i.e., textile, cement, foodcanning) and facilitate the transformation of daily working details from one factory to another, to advise or warn other factories on such matters. The main object is to raise productivity.

Responsible Organizations: The Federation of Arab Engineers.

Cooperating Organizations: Local Ministries of Industry or companies or factories.

Estimated Professional Man-Years Required: Two man-years for each branch of industry but not necessarily in each country.

Recommendation: The task force, in recognition of the value of the integrated documentation system which the Al-Ahram Organization has established in one iron and steel complex in Helwan, strongly recommends that the specialized agencies and similar industries in Arab and developing countries make use of the system.

## Critique of Proposed Industrial Information Systems Projects

Project No. 1: The Preparation of Users' Directory of Information Centers in Arab Countries

It is recommended that comprehensive information about the existing information centers in a region is a prerequisite for regional information system planning. However, a clear definition of the boundaries of the term "information centers" is needed.

It is recommended that this project be considered by the Information Division of the Industrial Development Center for Arab States (IDCAS) as part of its programme of activities. In considering this project IDCAS should be aware of the experience of some non-Arab countries in this area. Their failure to include sufficient information about each center and to update this information as needed, resulted in information center directories that had limited usefulness.

Project No. 2: An Engineering Information Center for Arab Countries

To test the feasibility of this project, it would be desirable to identify a specific international information center or service and seek to link with it. Actually the Engineering Standards project is an example of an international system (the ISO network which is still under development) and a proposed link to the Arab countries both through national standards organizations as well as a regional organization, ASMO.

Further specific examples should be sought and their feasibility explored. The needs of the potential users should be systematically ascertained.

Project No. 3: The Establishment of Local Specialized Industrial Information Centers.

The possible establishment of local specialized industrial information centers in specific industries is an attractive idea. To establish the feasibility of the proposal, it would be desirable to carry out the preliminary planning for a specific case. It would be essential to determine:

(1) the source of the industrial information
(2) the specific kinds of information to be handled by the center
(3) the information processing methods necessary to put it in a usable form
(4) A mechanism for delivering it efficiently and in a reasonable time period to the local industrial organization.

The Federation of Arab Engineers might well undertake the preliminary analysis necessary to identify industries for which an operating system might prove to be cost-effective.

Report and Recommendations of Specialized Task Force No. 5

Chairman: M. Madkour (EGYPT)

Topic: Computers and Telecommunication

Recommended Project No. 1: Creation of a Multi-Lingual (essentially: English/French/Arabic) Macro-thesaurus File of Engineering Terms Stored on Computer for Multi-lingual Search of Data Bases.

Objectives and Implementation Phases:

1. Basic thesaurus determination.
2. Elaboration of multi-lingual thesaurus.
   a. Standardization of terms' meanings.
   b. Standardization of Arabic characters representation.
3. Creation of the computer multi-file.
   a. Handling of problems inherent to the storing of the Arabic version together with the Latin version(s).
   b. Design of the necessary software to handle:
      -the multi-correspondency between each version of the file.
      -the multi-lingual search of data bases.

   c. Implementation Options:
      -re-design and modification of existing software.
      -design of a module that would be fitted to any existing package.

Responsible Organization: The sponsorship of all the projects submitted by Task Force 5 has been allocated to the CEI together with the Federation of Arab Engineers. They are to establish the necessary contacts with the national or international organizations that shall be in charge of the project's implementation.

This choice could be made out of the organizations mentioned in the following item.

Cooperating Organizations: Industrial Development Center for Arab States (IDCAS), UNIDO, UNESCO.

Estimated Professional Man-Years Required: Two man-years

* * *

Recommended Project No. 2: Electronics and Telecommunications Data Gathering According to Users' Needs.

Objectives and Implementation Phases:

1. Survey of users' needs.
   a. Researchers -- scientific material
   b. Designers -- research publications -- new products list.
   c. Projects Executers -- distribution of products and machinery -- systems engineering information.
   d. Operators -- data on equipment -- data on equipment and user interaction.
2. Data re-shaping and re-organization according to users levels and applications.

Responsible Organizations: The sponsorship of all the projects submitted by Task Force 5 has been allocated to the CEI together with the Federation of Arab Engineers. They are to establish the necessary contacts with the national or international organizations that shall be in charge of the project's implementation.

This choice could be made out of the organizations mentioned in the following item.

Cooperating Organizations: National Bureau of Standards (USA), UNIDO, INSPEC.

Estimated Professional Man-Years Required: Seven man-years.

* * * *

Recommended Project No. 3: Creation of Regional Macro-data Bases for Handling Technological Data Gathered from Ready-made Data Bases Produced in Magnetic Tapes Form.

Objectives and Implementation Phases:

1. Survey of relevant data-bases available.
2. Survey of users' needs.
3. Gathering of data.
4. Standardization of tapes configuration.
5. Design of users' interest profiles.
6. Re-dissemination of the gathered information: Standards and Conditions.

Responsible Organizations: The sponsorship of all the projects submitted by Task Force 5 has been allocated to the CEI together with the Federation of Arab Engineers. They are to establish the necessary contacts with the national or international organizations that shall be in charge of the project's implementation.

Cooperating Organizations: NRC (Canada), IDCAS, NBS (USA), UNIDO

Estimated Professional Man-Years Required: Two man-years.

"Task Force 5" also devoted some time to the discussion of the following two projects:

1. Handling of Arabic data on computers (storing, processing, and retrieval):

   a. Hardware Aspects
   -modification of input media/allocation of new machine language (EBCDIC) codes to the Arabic characters.
   -Output media/design of special chains, carriages or CRT's (cathode-ray tube) panels to allow bi-lingual or tri-lingual outputs.

   b. Software Aspects
   -Modification of straight-forward computer routines to handle new hexadecimal codes allocated.
   -Modification of the available ready-made packages to handle the Arabic data in its proposed configuration.

2. Installation of a regional Pan-Arab network of interactive information nodes within an automated information processing and retrieval system - (Potential supports: telephone lines - microwaves - satellites com.).

All members were unanimous in recognizing the importance of the above-mentioned topics which induced us to submit the following recommendations.

Recommendation No. 1: The use of computer techniques having become an essential common factor to each and every information system, and, because these techniques are of general importance in all engineering fields of activity, it is recommended that the CEI together with the Federation of Arab Engineers, in collaboration with all international and regional organizations concerned, arrange for a specific conference or seminar with the general theme: "The Use of Computers in Engineering Activities".

Recommendation No. 2: It is recommended that engineers be alerted to their need for information to enhance their day-to-day performance.

Recommendation No. 3: It is recommended that engineers be alerted to the existence of regional and international specialized information centers and provide them with tools to communicate with these centers to get the optimum benefit of the services of the centers.

## Critique of Proposed Computers and Telecommunications Project

Project No.1: Creation of a Multi-Lingual Macro-thesaurus File of Engineering Terms Stored on Computer for Multi-Lingual Search of Data Bases

Improved translation capability among the Arabic, French and English languages is of great importance to engineers in the Arab countries. Since the development of multi-lingual thesauri for multidisciplinary information systems would be a major undertaking, it is recommended that initial efforts be devoted to identifying specific engineering subjects for which thesaurus development could provide immediate benefits to information processors in the Arab countries. When the appropriate subject areas have been identified, this project should be actively pursued.

Project No. 2: Electronics and Telecommunications Data Gathering According to Users' Needs

The need for product and equipment data banks for African States is currently being proposed as a study area for UNESCO. It is recommended that this project be presented to UNESCO for their consideration as an extension of the African States study.

Project No. 3: Creation of Regional Macro-data Bases for Handling Technological Data Gathered from Ready-made Data Bases Produced in Magnetic Tape Form

To test the feasibility of this proposal it would be desirable to identify specific macro-data bases of particular importance to the Arab countries. An analysis of the spectrum of users, the delivery mechanism, and the specific informational services to be offered could serve to identify areas in which successful projects might be undertaken.

In addition to these projects, the Task Force also had three recommendations directed towards increasing the level of awareness of engineers to the importance of information in their practice of engineering and also the use of computer techniques. The first recommendation concerns the possibility of CEI and the Federation of Arab Engineers sponsoring a conference on the use of computers in engineering activities. The use of computers in the various branches of engineering has become so diversified that it would be difficult to have the conference focus on engineering rather than computer techniques. A possibly more effective means of reaching the desired objective would be to include special sessions at regular conferences held in the various specialized fields of engineering devoted to computer applications. By this means, the capabilities of computer techniques could be made more widely known to practising engineers.

The final two recommendations relating to alerting engineers to their need for improved informational services and the existence of such services in other areas are a direct challenge to the University faculties of engineering and to the engineering professional societies.

Their support of such efforts is essential to the development of greater individual awareness of the powerful effect of improved information systems and the success of engineering projects.

# ENGINEERING INFORMATION PROJECTS RECOMMENDED BY THE SPECIALIZED TASK FORCES

F. K. Willenbrock

## Concluding Remarks

It is important to note that the proposals presented by the five Specialized Task Forces were prepared by a dedicated group of individuals from different countries throughout the world who had not known each other before they met at the Cairo Conference for the first time. The fact that despite language barriers they were able to communicate so effectively is in itself a remarkable feat. But it is even more remarkable to note that this heterogenous group, working under a time constraint of one day, was able, within this time scale, to define areas of engineering information needs for the Arab countries and to produce projects all of which are valuable enough to be deemed worthy of further consideration and investigation.

Because of the time scale under which they worked, the five Specialized Task Forces were not able to develop their ideas in great detail. The report, therefore, consists of outlines rather than substantive proposals.

We wish to acknowledge the very important step forward taken by the Federation of Arab Engineers in the recent organization of the Arab Committee on Engineering Information and Publications. We welcome this Committee as a mechanism through which the World Federation of Engineering Organizations' Committee on Engineering Information can communicate effectively with the Arab nations. We anticipate that, through this Committee, the communications which were initiated at the Conference can be further developed on a continuing basis.

## SPECIALIZED TASK FORCE MEMBERS

1. Housing and Construction

Chairman : A. R. Hassanein

Participants :
S. Bedeir
R. S. Elaly
J. L. Haecker
A. S. Hamza
H. M. Hassan
A. El Hingari
I. A. Kamel
G. Nassar
J. O. Osibamowo
S. Razzak
W. N. Sefaine
H. C. Visvesvaraya

2. Engineering Standards

Chairman : A. M. Tewfik

Participants :
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S. Bayan
L. D. Eicher
A. S. Sabbegh
A. M. Sadek
F. Zakaria

3. Energy and Power

Chairman : O. K. Mawardi

Participants :
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Madame A. David
[illegible] Khayat
S. Kushad
M. Maghraby
A. S. Mekkawy
M. Shaarani

4. Industrial Information Systems

Chairman : S. Shaikhly

Participants :
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A. Avramescu
P. Bjørnstad
A. H. Essam
M. Hijazi
M. Jardeneh
P. Lazar
M. Mansour
M. Milad
W. Pirog
J. Quevedo-Procel
J. Van Oot

5. Computers and Telecommunication

Chairman : M. Madkour

Participants :
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M. T. Badr
M. Bahget
S. Fleish
M. Hammouda
M. Mansour
M. Milad
S. M. Shaaban

APPENDIX 1

PROGRAMME OF THE CONFERENCE

Monday, April 22 1974

Opening Session

| | |
|---|---|
| Chairman: | H. Kaddah<br>Chairman of the Conference Organizing Committee |
| Welcome: | A. Moharram<br>President, Egyptian Society of Engineers (EGYPT) |
| Address: | M.A. Hafez<br>H.E. The Minister of Housing & Construction (EGYPT) |
| Address: | S. Ben Jemaa (TUNISIA)<br>President, Federation of Arab Engineers |
| Address: | A.Y. Saad<br>H.E. The Minister of Irrigation (EGYPT) |
| Keynote Address: | G.F. Gainsborough<br>Secretary-General, World Federation of Engineering Organizations (WFEO) |
| Keynote Address: | F.K. Willenbrock<br>Director, Institute for Applied Technology, National Bureau of Standards USA and Chairman, WFEO Committee on Engineering Information |

Session: INTERNATIONAL PROGRAMS FOR ENGINEERING INFORMATION

Chairmen: F.K. Willenbrock (USA)
A.R. Hassanein (EGYPT)

UNISIST and technical information needs of developing countries
A. Wysocki (UNESCO)

The UNIDO industrial information clearing-house
V. Pavlov (UNIDO)

Monday, April 22 1974 continued

Session: SELECTED ENGINEERING INFORMATION SYSTEMS

Chairmen: F.K. Willenbrock (USA)
A.R. Hassanein (EGYPT)

Engineering information in the Eastern European Socialist countries
P. Lazar (HUNGARY)

Engineering information systems
D.H. Barlow (UK)

The Canadian approach to scientific and technological information dissemination
J.D. Keys (CANADA)

The State system of scientific and technical information in the USSR
V. Krasnov (USSR)

Tuesday, April 23 1974

Session: ENGINEERING INFORMATION IN ARAB COUNTRIES

Chairmen: G.F. Gainsborough (WFEO)
S. Khayat (LEBANON)

Engineering information centre
N.A. Taleb (EGYPT)

The attitude of Tunisian engineers toward scientific and technical information
M. Milad (TUNISIA)

Report on the requirements and prospects for standardization informational documentation in Lebanon
M. Hijazi (LEBANON)

A central network for engineering information system
S. Shaikhly (IRAQ)

Communication and transfer of technology
Y. Mazhar (EGYPT)

An automated documentation service: IDCAS experience
M. Madkour (EGYPT)

Session: NEEDS FOR ENGINEERING INFORMATION IN INDUSTRIALIZING ECONOMIES

Chairmen: V. Krasnov (USSR)
S. Ben Jemaa (FAE)

Engineering information in industrializing economies - The Indian trend in retrospect and prospect
H.C. Visvesvaraya (INDIA)

Engineering information in developing countries
J.O. Osibamowo (NIGERIA)

Information requirements in industrializing economies
J. Quevedo-Procel (MEXICO)

Wednesday, April 24 1974

Session: OVERCOMING BARRIERS TO EFFECTIVE ENGINEERING DIFFUSION

Chairmen: P. Lazar (HUNGARY)
H. Kaddah (EGYPT)

Barriers to the efficient transfer of information for industrial needs
A. David (FRANCE)

Overcoming barriers to effective engineering information transfer
P. Bjørnstad (NORWAY)

Session: SELECTED ENGINEERING INFORMATION SYSTEMS

Chairmen: D.H. Barlow (UK)
H. Kaddah (EGYPT)

Increased utilization of engineering standards for the benefit of developing countries
L.D. Eicher (USA)

Classification and retrieval system for iron and steel complex technical documents
S. Shalaby (EGYPT)

Establishment of an electrical information centre
A. Amin (EGYPT)

Session: FORMATION OF SPECIALIZED TASK FORCES AND JOINT MEETING WITH THE WFEO COMMITTEE ON ENGINEERING INFORMATION

Task Force Topics:

1. Housing and construction
2. Engineering standards
3. Energy and power
4. Industrial information systems
5. Computers and telecommunication

Thursday, April 25 1974

Session: CHARACTERISTICS OF SPECIFIC ENGINEERING INFORMATION SYSTEMS

Chairmen: L.D. Eicher (USA)
I. Osman (EGYPT)

Electric power needs for a developing country
O.K. Mawardi (USA)

Systems questionnaire
G. Nassar (EGYPT)

Information for the building community
J.L. Haecker (USA)

Functions of a centralized information support service in an industrial organization
J.G. Van Oot (USA)

* Contribution by
S. Eleish (EGYPT)

*It is regretted that title and synopsis of text of the paper are not available.

Friday, April 26 1974

Session: PRESENTATION OF RECOMMENDED PROPOSALS OF THE SPECIALIZED TASK FORCES

Chairman: F.K. Willenbrock (USA)

Closing Session

Speakers: F.K. Willenbrock (USA)
H. Kaddah (EGYPT)
A. Moharram (EGYPT)
S. Ben Jemaa (FAE)

APPENDIX 1

WFEO COMMITTEE ON

ENGINEERING INFORMATION

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| A. Avramescu | Scientific Documentation Centre of the Rumanian Academy, Bucharest, Rumania. |
| D. H. Barlow | INSPEC,<br>Savoy Place, London, WC2R OBL,<br>United Kingdom. |
| P. Bjørnstad | Ingeniørforlaget A/S, Kronprinsensgate 17,<br>Oslo 2, Norway. |
| A. David (Madame) | Directeur du Centre de Documentation de 1'Institut Francaise des Combustibles et de 1'Energie, 3 Rue Henri-Heine,<br>Paris 75016, France. |
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| H. A. Kaddah | Vice-President,<br>Egyptian Society of Engineers,<br>c/o 13 Antkhana Street, Cairo, Egypt. |
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| V. Krasnov | Directorate of Scientific and Technical Information and Dissemination,<br>State Committee of Science and Technology,<br>USSR Council of Ministers, Gorky Street 11,<br>Moscow, USSR. |

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| J. Larink | VDI-Verlag, Graf-Recke-Strasse 84,<br>4 Dusseldorf 1, Federal Republic of Germany. |
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| W. Pirog | NOT, Czackiego 3/5, Warsaw, Poland. |
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*Chairman of Committee

APPENDIX 3

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# APPENDIX 4

## LIST OF NAMES AND ADDRESSES OF CONFERENCE PARTICIPANTS

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